NOTICES *

DETAILED DESCRIPTION

Detailed Description of the Invention]

0001]

Field of the Invention]This invention relates to the semiconductor laser device which carries two or more laser chips of different wavelength in one package.

0002]

Description of the Prior Art]In order to enable it to access a different optical storage medium called the media f recent years, for example, a CD system, and the media of a DVD system with one optical pickup device, he semiconductor laser device which carries two or more laser chips of wavelength which is different as ndicated by JP,2000-113486,A in one package is proposed increasingly.

0003]

Problem(s) to be Solved by the Invention]However, when FFP (far field pattern: far field pattern) of the emiconductor laser carried in such a semiconductor laser device is temporarily the same, the following faults rise.

0004]The relation of FFP of the object lens NA and a semiconductor laser is shown in drawing 4.

0005]For example, to the media of a CD system, NA is 0.5, and NA is 0.65 to the media of a DVD system. As or the Rim intensity (light intensity at the time of NA0.5) of a CD system, in the figure, 0.3 and the Rim ntensity (light intensity at the time of NA0.65) of a DVD system are set to 0.13.

0006]Therefore, to the Rim intensity of a CD system being high enough, and a spot being extracted in this :ase, the Rim intensity of a DVD system is insufficient and a desired spot diameter is not obtained.

0007]This invention solves the above problem and aims to let the design of an optical pickup provide an easy emiconductor laser device.

0008]

Means for Solving the Problem]In a semiconductor laser device which carries two or more laser chips of lifferent wavelength in one package, this invention sets up each minimum FFP of two or more laser chips so hat the one where wavelength is longer may serve as a smaller value.

0009]In a semiconductor laser device which carries two laser chips, an object for CD, and an object for DVD, n one package, the minimum FFP of a laser chip for CD is set up become a value smaller than the minimum FP of a laser chip for DVD.

[0010]In a semiconductor laser device which carries two laser chips, an object for CD, and an object for DVD, in one package, the minimum FFP of a laser chip for CD is set up become the FFP of a laser chip for DVD 0.52 to 0.61 time the value of the minimum.

[0011]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described in detail, referring to an accompanying drawing.

[0012]Drawing 1 shows the semiconductor laser device concerning one example of this invention.

[0013]The laser chip 2 to put on the figure and for the semiconductor laser device 1 access the media (CD-ROM, CD-R, CD-RW) of a CD system, for example (record / reproduction / elimination). It is constituted by the laser chip 3 for accessing the media (DVD-ROM, DVD-R, DVD+R, DVD+RW, DVD-RW) of a DVD system, the mirror 4 and the photo detector 5, the hologram 6, and the case 7.

[0014]It is reflected in respect of one side of the mirror 4, and the emitted light from the laser chip 2 penetrates the hologram 6, and is irradiated by the optical disc 9 with the object lens 8.

[0015]And via the object lens 8, the catoptric light from the optical disc 9 is led to the 1st light sensing portion of the photo detector 5 by the hologram 6, and reads the information on the optical disc 9.

[0016]It is reflected in respect of [of the mirror 4] the 2nd, and the emitted light from the laser chip 3 penetrates the hologram 6, and is irradiated by the optical disc 9 with the object lens 8.

[0017]And via the object lens 8, the catoptric light from the optical disc 9 is led to the 2nd light sensing portion of the photo detector 5 by the hologram 6, and reads the information on the optical disc 9.

[0018]Here, the relation of the kind of the present optical disc and NA of wavelength and an object lens is as follows.

[0019]

CD system: Wavelength =790nm, NA=0.5 [0020]

DVD system: Wavelength =660nm, NA=0.65 [0021]

Next generation DVD: Wavelength =500nm, NA=0.85 [0022]Thus, wavelength becomes short with a generation and NA is large.

[0023]It is necessary to make FFP small (it is greatly about FFP, so that wavelength is short), so that wavelength is temporarily long for making Rim intensity the same at least using the same object lens in these.

[0024]For example, Rim intensity with FFP of the semiconductor laser of the for 6.5 degrees and for CD systems in FFP of the semiconductor laser of the for 8.5 degrees and for DVD systems in FFP of the semiconductor laser for next generation DVDs same at 5 degrees is obtained, and the spot diameter corresponding to the Rim intensity is obtained.

[0025]FFP said here although FFP(s) differ in the emission direction (length and width) of a semiconductor laser shows the smaller one (a minimum of FFP) of them.

[0026]Thus, in the semiconductor laser device which carries the laser chip the object for CD, and for DVD in one package in this example, a minimum of [of the laser chip for CD] ~ FFP ~ a minimum of [of the laser chip for DVD] ~ since it has set up smaller than FFP, it becomes possible using the same engineering system to make small the spot of both the laser beam for CD, and the laser beam for DVD.

[0027]By the way, what is called a Super Combo Drive device with which CD-R / RW drive device, and the

DVD+R/RW drive device were united is gaining popularity now. As for the semiconductor laser device used for his device, it is desirable to fulfill the following conditions, and the normal record reproduction of it becomes possible by fulfilling the following conditions.

[0028]Here, the relation of FFP of the object lens NA and the semiconductor laser of a CD system is shown in drawing 2. the minimum to which, as for the Rim intensity of NA0.5, 0.14**0.04 guarantees spot form -- It is required Rim intensity.

[0029]The relation of FFP of the object lens NA and the semiconductor laser of a DVD system is shown in drawing 3. the minimum to which, as for the Rim intensity of NA0.65, 0.35 guarantees spot form -- It is required Rim intensity.

[0030]Thus, FFP of the semiconductor laser of a DVD system needs to be larger than FFP of the semiconductor laser of a CD system enough so that clearly from drawing 2 and drawing 3.

[0031]Therefore, as mentioned above, FFP of the laser beam which the laser chip 2 in the semiconductor laser device 1 shown in drawing 1 outputs in the mode of drawing 2 by what FFP of the laser beam which the laser chip 3 outputs is set as the mode of drawing 3 for. Required light intensity can be obtained using the same object lens 8.

[0032]the minimum to which a CD system and a DVD system guarantee spot form from drawing 2 and drawing 3 -- the following conditions are required in order to obtain required Rim intensity.

[0033]Namely, as shown in drawing 2, in the laser beam of a CD system. the minimum to which, as for the Rim intensity of NA0.5, 0.14**0.04 guarantees spot form -- if FFP is considered as Gaussian distribution when Rim intensity is 0.1 (0.14-0.04) first since it is required Rim intensity, the value of sigma of NA0.5 will be set to 2.15sigma. (From $EXP(-X^2/2sigma^2) =0.1$, it is $X=2.15sigma$)

[0034]the minimum to which, as for the Rim intensity of NA0.65, 0.35 guarantees spot form by the laser beam of a DVD system on the other hand as shown in drawing 3 -- since it is required Rim intensity, the value of sigma of NA0.65 is similarly set to 1.45sigma. If NA is considered according to 0.5, It will be set to 2.15sigma in a CD system, and will be set to 1.12sigma in a DVD system. That is, FFP of a CD system will be 0.52 time the FFP of a DVD system.

[0035]Next, considering the case where the Rim intensity of NA0.5 of the laser beam of a CD system is 0.18 (0.14+0.04), the value of sigma is set to 1.85sigma.

[0036]the minimum to which, as for the Rim intensity of NA0.65, 0.35 guarantees spot form by the laser beam of a DVD system by drawing 3 on the other hand -- since it is required Rim intensity, the value of sigma of NA0.65 is similarly set to 1.45.

[0037]Therefore, if NA is considered according to 0.5, in the laser beam of a CD system, it will become 1.12 at he laser beam of 1.85sigma and a DVD system. That is, FFP of CD-system-laser light will be 0.61 time the FFP of the laser beam of a DVD system.

[0038]As mentioned above, when using the same object lens 8, FFP of the CD-system-laser light outputted from the laser chip 2 should just be 0.52 time - 0.61 time the FFP of the laser beam of the DVD system outputted from the laser chip 3.

[0039]incidentally, a spot becomes small, so that Rim intensity is large -- apparently -- it is large -- although not exceeded, in order to enlarge Rim intensity, it is necessary to enlarge the output of a semiconductor laser, and

lim intensity cannot be enlarged recklessly. It is preferred to increase FFP of a CD system 0.52 time - 0.61 me of FFP of a DVD system also in such meanings.

)040]

Effect of the Invention]In the semiconductor laser device which carries two or more laser chips of different wavelength in one package according to this invention as explained above, Each minimum FFP of two or more aser chips acquires the effect of becoming possible to make small the spot corresponding to two or more laser hips, by making small the one where wavelength is longer.

)041]moreover -- in the semiconductor laser device which carries the laser chip the object for CD, and for)VD in one package -- a minimum of [of the laser chip for CD] -- FFP -- a minimum of [of the laser chip for)VD] -- by making it smaller than FFP. The effect that the spot of the object for CD and both for DVD can be nade small is acquired.

)042]In the semiconductor laser device carried in one package, the laser chip the object for CD, and for DVD ne minimum FFP of the laser chip for CD, a minimum of [of the laser chip for DVD] -- the effect of becoming ossible to make small the spot of the object for CD and both for DVD is also acquired by carrying out by 0.51 ɔ 0.59 time the FFP.

[Translation done.]